1) **Members of Team 26:** Ayhun Tekat, Efdal Ustaoğlu, Ali Naci Uysal

2) **Main Idea of the Prototype & Practical Relevance**

We developed vending machine prototypes that can send sale information and internal temperature information to our server using MQTT protocol. A python script will update the MySQL database according to the information contained in the MQTT message.

Our web server allows vending company to mine information to gain a better intuition about which products are sold more in which locations and with that information more space can be allocated to that product. To the best of our knowledge, vending machines are filled by the vending company once or twice a month without knowing which items are ran out.

Above-mentioned temperature information is captured using temperature sensors, which will be useful for notifying the vending company in case of a malfunction in the cooling system through our web server. As an environmentally aware company, we don't want our vending machines to consume energy continuously. Therefore, we used distance sensors to detect if someone approaches to the machine and keep the lights on only if someone is near.

We also developed an iOS application that allows customers to make purchases directly from their phones and get their products without searching for coins.

3) **Proposed Architecture of the Project & Problems Faced**

Proposed architecture of the project is depicted in Figure 1.

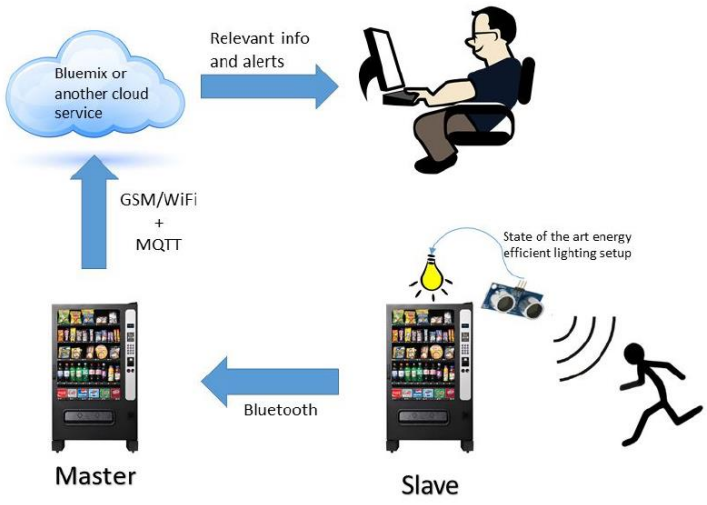

Figure 1 – Proposed Architecture of the Project

Although we proposed to create Bluetooth communication between two vending machines, namely slave and master vending machines, the Bluetooth communication was not reliable to send/receive data, i.e. we were not able to create this communication between Raspberries everytime. Therefore, we connected both raspberries to the internet via WiFi and simulated how bluetooth connection will be used with MQTT. So a communication between slave and master happens via MQTT rather than Bluetooth. In the real world, this will be a good work-around for continuous development until a reliable communication method is integrated (e.g. radio).

The current architecture of the project is depicted in Figure 2.

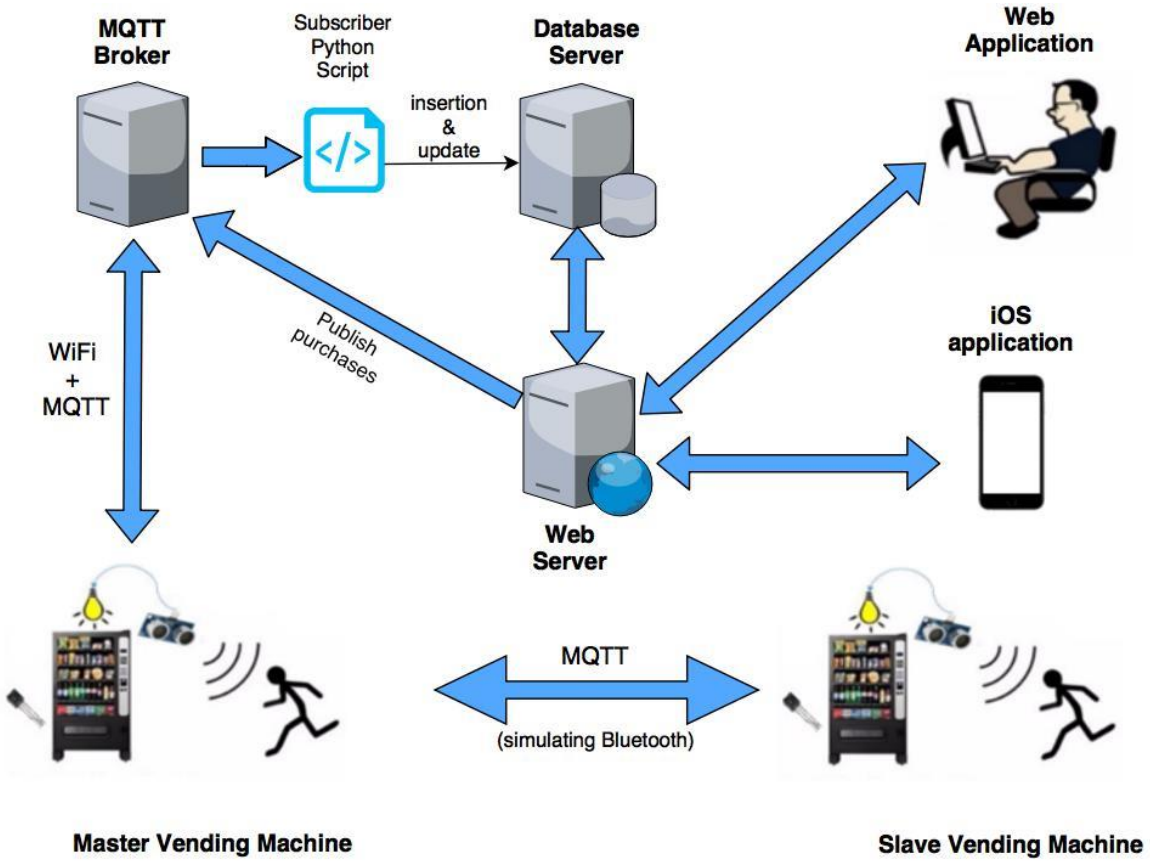

Figure 2 – Current Architecture of the Project

We used free trial of HiveMQ Broker for MQTT communication. As mentioned before, our Python script subscribes to the HiveMQ server and makes necessary temperature insertions and item updates in our MySQL server. Our web server is based on REST architecture and it allows companies to monitor vending machines and items using the web application. It also allows customers to order products using an iOS application. Furthermore, company employee, who refills the vending machine, can update item amounts using same iOS application.

4) Sensors Used

For this project, we used following hardware:

1) DS18B20 Temperature sensor

2) HC-SR04 distance sensor

3) Tactile buttons

4) Leds

5) Respective resistors

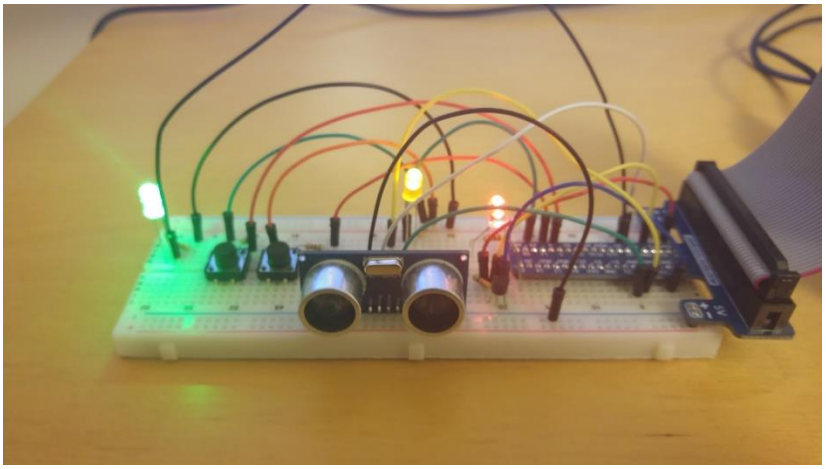

Figure 2 – Master Vending Machine

5) Future Work

We believe that, our project can be extended in different aspects: vending company can change prices of items without being at the head of the vending machine. It can also push some notifications to users via iOS application about new items, discounted items etc.